

## THE CLAIMS

We claim:

1. A computer readable medium containing executable code comprising:

code that reads digitized gamma ray data passively derived from gamma ray emissions from a container;

code that analyzes said data to determine if said digitized gamma ray data is one of (a) commensurate with a predetermined gamma ray fingerprint and (b) anomalous to an expected gamma ray fingerprint; and

code that signals that said container contains radiation or fissile material or radiation shielding material in the event said data is commensurate with one of said predetermined fingerprint and anomalous to said expected fingerprint.

2. The computer readable medium of claim 1 wherein said code that reads includes:

code that reads raw digital data corresponding to said gamma ray emissions;

code that subtracts predetermined background data from said raw digital data to develop said digitized gamma ray data.

3. The computer readable medium of Claim 2 wherein said code that reads said digitized gamma ray data further includes code that provides said raw digital data as at least one of intensity data and energy spectrum data.

4. The computer readable medium of Claim 1 wherein said code that analyzes includes:

code that compares said digitized gamma ray data to a plurality of predetermined digitized gamma ray fingerprints stored in a first database, said predetermined fingerprint being one of said plurality of predetermined fingerprints heuristically matching said digitized gamma ray data;

code that compares, in the event said digitized gamma ray data does not heuristically match one of said predetermined fingerprints, said digitized gamma ray data to a selected one of a plurality of further gamma ray fingerprints stored in a second database, said digitized gamma ray data being anomalous to said expected fingerprint in the event said digitized gamma ray data does not heuristically match said selected one of said further gamma ray fingerprints.

5. The computer readable medium of Claim 4 wherein said code that analyzes further includes code that compares, in the event said digitized gamma ray data is anomalous to said expected fingerprint, said digitized gamma ray data to at least one digitized gamma ray background fingerprint stored in a third database, said digitized gamma ray data being further anomalous to said expected fingerprint in the event said digitized gamma ray data does not heuristically match said background fingerprint.

6. The computer readable medium of Claim 5 wherein said code that analyzes further includes code that compares, in the event said digitized gamma ray data does not heuristically match said background fingerprint, said digitized gamma ray data to each of said plurality of further fingerprints stored in said second database, said digitized gamma ray data being anomalous to said expected fingerprint in the event said digitized gamma ray data does not heuristically match any one of said further gamma ray fingerprints.

7. The computer readable medium of Claim 5 further comprising code that stores in said second database said digitized gamma ray data as one of said further fingerprints in the event said digitized gamma ray data heuristically matches said background fingerprint.

8. The computer readable medium of Claim 7 wherein said code that stores includes:  
code that reads from an electronically stored manifest associated with said container at least one standardized commodity ID, and  
code that associates said digitized gamma ray data with said standardized commodity ID upon being stored as one of said further fingerprints.

9. The computer readable medium of Claim 4 further comprising:  
code that stores digitized gamma ray data obtained from a test container containing a known quantity of a known radioactive or fissile material in said first database as one of said predetermined fingerprints.

10. The computer readable medium of Claim 9 wherein said code that stores includes:  
code that reads digital gamma ray data from said test container when empty;  
code that reads digital gamma ray data from said container when said material is present in said container; and  
code that subtracts said data read when said test container is empty from said data when said test container contains said material to derive said predetermined fingerprint.

11. A method of detecting radiation or fissile material or radiation shielding material in shipping containers comprising steps of:

reading digitized gamma ray data passively derived from gamma ray emissions from a container;

analyzing said data to determine if said digitized gamma ray data is one of (a) commensurate with a predetermined gamma ray fingerprint and (b) anomalous to an expected gamma ray fingerprint; and

signaling that said container contains radiation or fissile material or radiation shielding material in the event said data is commensurate with one of said predetermined fingerprint and anomalous to said expected fingerprint.

12. The method of claim 11 wherein said reading step includes steps of:

reading raw digital data corresponding to said gamma ray emissions;

subtracting from said raw digital data predetermined background data to develop said digitized gamma ray data.

13. The method of Claim 12 wherein said reading said digitized gamma ray data step further includes the step of providing said raw digital data as at least one of intensity data and energy spectrum data.

14. The method of Claim 11 wherein said analyzing step includes steps of:

comparing said digitized gamma ray data to a plurality of predetermined digitized gamma ray fingerprints stored in a first database, said predetermined fingerprint being one of said plurality of predetermined fingerprints heuristically matching said digitized gamma ray data;

comparing, in the event said digitized gamma ray data does not heuristically match one of said predetermined fingerprints, said digitized gamma ray data to a selected one of a plurality of further gamma ray fingerprints stored in a second database, said digitized gamma ray data being anomalous to said expected fingerprint in the event said digitized gamma ray data does not heuristically match said selected one of said further gamma ray fingerprints.

15. The method of Claim 14 wherein said analyzing step further includes the step of comparing, in the event said digitized gamma ray data is anomalous to said expected fingerprint, said digitized gamma ray data to at least one digitized gamma ray background fingerprint stored in a third database, said digitized gamma ray data being further anomalous to said expected fingerprint in the event said digitized gamma ray data does not heuristically match said background fingerprint.

16. The method of Claim 15 wherein said analyzing step further includes the step of comparing, in the event said digitized gamma ray data does not heuristically match said background fingerprint, said digitized gamma ray data to each of said plurality of further fingerprints stored in said second database, said digitized gamma ray data being anomalous to said expected fingerprint in the event said digitized gamma ray data does not heuristically match any one of said further gamma ray fingerprints.

17. The method of Claim 15 further comprising the step of:  
storing in said second database said digitized gamma ray data as one of said further fingerprints in the event said digitized gamma ray data heuristically matches said background fingerprint.

18. The method of Claim 17 wherein said storing step includes the steps of:  
reading from an electronically stored manifest associated with said container at least one  
standardized commodity ID, and  
associating said digitized gamma ray data with said standardized commodity ID upon  
being stored as one of said further fingerprints.

19. The method of Claim 14 further comprising the step of:  
storing digitized gamma ray data obtained from a test container containing a known  
quantity of a known radioactive or fissile material in said first database as one of said  
predetermined fingerprints.

20. The method of Claim 19 wherein said storing step includes steps of:  
reading digital gamma ray data from said test container when empty;  
reading digital gamma ray data from said container when said material is present in said  
container; and  
subtracting said data read when said test container is empty from said data when said test  
container contains said material to derive said predetermined fingerprint.

21. An apparatus for detecting radiation or fissile material or radiation shielding  
material in shipping containers comprising:  
means for reading digitized gamma ray data passively derived from gamma ray  
emissions from a container;

means for analyzing said data to determine if said digitized gamma ray data is one of (a) commensurate with a predetermined gamma ray fingerprint and (b) anomalous to an expected gamma ray fingerprint; and

means for signaling that said container contains radiation or fissile material or radiation shielding material in the event said data is commensurate with one of said predetermined fingerprint and anomalous to said expected fingerprint.

22. The apparatus of claim 21 wherein said reading means includes:

means for reading raw digital data corresponding to said gamma ray emissions;

means for subtracting from said raw digital data predetermined background data to develop said digitized gamma ray data.

23. The apparatus of Claim 22 wherein said digitized gamma ray data reading means further includes means for providing said raw digital data as at least one of intensity data and energy spectrum data.

24. The apparatus of Claim 21 wherein said analyzing means includes:

means for comparing said digitized gamma ray data to a plurality of predetermined digitized gamma ray fingerprints stored in a first database, said predetermined fingerprint being one of said plurality of predetermined fingerprints heuristically matching said digitized gamma ray data;

means for comparing, in the event said digitized gamma ray data does not heuristically match one of said predetermined fingerprints, said digitized gamma ray data to a selected one of

a plurality of further gamma ray fingerprints stored in a second database, said digitized gamma ray data being anomalous to said expected fingerprint in the event said digitized gamma ray data does not heuristically match said selected one of said further gamma ray fingerprints.

25. The apparatus of Claim 24 wherein said analyzing means further includes means for comparing, in the event said digitized gamma ray data is anomalous to said expected fingerprint, said digitized gamma ray data to at least one digitized gamma ray background fingerprint stored in a third database, said digitized gamma ray data being further anomalous to said expected fingerprint in the event said digitized gamma ray data does not heuristically match said background fingerprint.

26. The apparatus of Claim 25 wherein said analyzing means further includes means for comparing, in the event said digitized gamma ray data does not heuristically match said background fingerprint, said digitized gamma ray data to each of said plurality of further fingerprints stored in said second database, said digitized gamma ray data being anomalous to said expected fingerprint in the event said digitized gamma ray data does not heuristically match any one of said further gamma ray fingerprints.

27. The apparatus of Claim 25 further comprising:

means for storing in said second database said digitized gamma ray data as one of said further fingerprints in the event said digitized gamma ray data heuristically matches said background fingerprint.



28. The apparatus of Claim 27 wherein said storing means includes:

means for reading from an electronically stored manifest associated with said container at least one standardized commodity ID, and

means for associating said digitized gamma ray data with said standardized commodity ID upon being stored as one of said further fingerprints.

29. The apparatus of Claim 24 further comprising:

means for storing digitized gamma ray data obtained from a test container containing a known quantity of a known radioactive or fissile material in said first database as one of said predetermined fingerprints.

30. The apparatus of Claim 29 wherein said storing means includes:

means for reading digital gamma ray data from said test container when empty;

means for reading digital gamma ray data from said container when said material is present in said container; and

means for subtracting said data read when said test container is empty from said data when said test container contains said material to derive said predetermined fingerprint.

31. An apparatus for detecting radiation or fissile material or radiation shielding material in shipping containers comprising:

a sensor to detect gamma ray emissions from said container such that digitized gamma ray data is obtained; and

a computer programmed to analyze said data to determine if said digitized gamma ray data is one of (a) commensurate with a predetermined gamma ray fingerprint and (b) anomalous

to an expected gamma ray fingerprint, said computer being further programmed to signal that said container contains radiation or fissile material or radiation shielding material in the event said data is commensurate with one of said predetermined fingerprint and anomalous to said expected fingerprint.

32. The apparatus of claim 31 wherein said computer is further programmed to read from said sensor raw digital data corresponding to said gamma ray emissions and to subtract from said raw digital data predetermined background data to develop said digitized gamma ray data.

33. The apparatus of Claim 32 wherein said raw digital data is at least one of intensity data and energy spectrum data.

34. The apparatus of Claim 31 further comprising:  
a first database containing a plurality of predetermined digitized gamma ray fingerprints;  
and  
a second database containing a plurality of further digitized gamma ray fingerprints;  
said computer being further programmed to compare said digitized gamma ray data to a selected one of said plurality of predetermined fingerprints stored in said first database, said predetermined fingerprint being said selected one of said plurality of predetermined fingerprints heuristically matching said digitized gamma ray data; and

said computer being further programmed to compare, in the event said digitized gamma ray data does not heuristically match one of said predetermined fingerprints, said digitized gamma ray data to a selected one of said further gamma ray fingerprints stored in said second

database, said digitized gamma ray data being anomalous to said expected fingerprint in the event said digitized gamma ray data does not heuristically match said selected one of said further gamma ray fingerprints.

35. The apparatus of Claim 34 further comprising:

a third database containing at least one digitized gamma ray background fingerprint;

said computer being further programmed to compare, in the event said digitized gamma ray data is anomalous to said expected fingerprint, said digitized gamma ray data to said background fingerprint stored in said third database, said digitized gamma ray data being further anomalous to said expected fingerprint in the event said digitized gamma ray data does not heuristically match said background fingerprint.

36. The apparatus of Claim 35 wherein said computer is further programmed to compare, in the event said digitized gamma ray data does not heuristically match said background fingerprint, said digitized gamma ray data to each of said plurality of further fingerprints stored in said second database, said digitized gamma ray data being anomalous to said expected fingerprint in the event said digitized gamma ray data does not heuristically match any one of said further gamma ray fingerprints.

37. The apparatus of Claim 35 said computer is further programmed to store in said second database said digitized gamma ray data as one of said further fingerprints in the event said digitized gamma ray data heuristically matches said background fingerprint.

38. The apparatus of Claim 37 wherein computer is further programmed to read from an electronically stored manifest associated with said container at least one standardized commodity ID to associate said digitized gamma ray data with said standardized commodity ID upon being stored as one of said further fingerprints.

39. The apparatus of Claim 34 wherein said computer is further programmed to store digitized gamma ray data obtained from a test container containing a known quantity of a known radioactive or fissile material in said first database as one of said predetermined fingerprints.

40. The apparatus of Claim 39 wherein said computer is further programmed to read digital gamma ray data from said test container when empty, to read digital gamma ray data from said container when said material is present in said container, and to subtract said data read when said test container is empty from said data when said test container contains said material to derive said predetermined fingerprint.

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